## CLAIMS

What is claimed is:

1    1.    A processor implemented data processing method comprising:

2         identifying a first plurality of regions within a first recursively

3    partitioned/nested geometric structure that correspond to a first plurality of

4    normalized multi-dimensional data of a first normalized multi-dimensional data

5    space, the first recursively partitioned/nested geometric structure being

6    corresponding to the first normalized multi-dimensional data space;

7         determining corresponding first graphing values for said first corresponding

8    regions within said first recursively partitioned/nested geometric structure

9    determined for said first normalized multi-dimensional data of said first normalized

10   multi-dimensional data space;

11        associating corresponding first visual attributes with said first corresponding

12   regions within said first recursively partitioned/nested geometric structure, based at

13   least in part on corresponding ones of said determined first graphing values; and

14        displaying said first recursively partitioned/nested geometric structure, visually

15   differentiating said first corresponding regions based at least in part on

16   corresponding ones of said associated first visual attributes.

1    2.    The method of claim 1, wherein each of said first normalized multi-

2    dimensional data of said first normalized multi-dimensional data space comprises a

3    plurality of relative coordinate values, and the method further comprises constructing

4    a polynary string to represent each of said first normalized multi-dimensional data

5    and its corresponding one of said first regions within said first recursively

6   partitioned/nested geometric structure in accordance with the relative coordinate

7   values.

1   3.      The method of claim 2, wherein said constructing of a polynary string to

2   represent each of said first normalized multi-dimensional data and its corresponding

3   one of said first regions within said first recursively partitioned/nested geometric

4   structure in accordance with the relative coordinate values comprises selecting a

5   symbol as the next symbolic member of the polynary string based on which of the

6   relative coordinate values is the current highest relative coordinate value.

1   4.      The method of claim 3, wherein said constructing of a polynary string to

2   represent each of said first normalized multi-dimensional data and its corresponding

3   one of said first regions within said first recursively partitioned/nested geometric

4   structure in accordance with the relative coordinate values further comprises

5   reducing the highest relative coordinate value in by an amount (G), upon each

6   selection, and reducing the amount (G) after each reduction.

1   5.      The method of claim 4, wherein the amount (G) initially equals $1 - F$, and

2   thereafter reduced each time by $G*(1 - F)$, where F equals $(n - 1)/n$, and n equals

3   the number of relative coordinate values.

1   6.      The method of claim 2, wherein said determining of corresponding first

2   graphic values comprises determining frequencies of occurrence of the various

3   polynary strings of said first normalized multi-dimensional data, and assigning the

4   determined frequencies of occurrence to the corresponding first regions within the

5 first recursively partitioned/nested geometric structure as the determined first

6 graphing values of the corresponding first regions.

1 7. The method of claim 1, wherein said determining of corresponding first

2 graphic values comprises assigning first output values corresponding to the first

3 normalized multi-dimensional data as the determined first graphing values of the

4 corresponding first regions within the first recursively partitioned/nested geometric

5 structure.

1 8. The method of claim 7, wherein said determining of corresponding first

2 graphic values further comprises computing said first output values.

1 9. The method of claim 8, wherein each of said first normalized multi-

2 dimensional data of said first normalized multi-dimensional data space comprises a

3 polynary string having a plurality of symbols, encoding a plurality of relative

4 coordinate values, and said computing of the first output values comprises

5 for each constituting symbols of a polynary string, summing one or more

6 appearance values corresponding to one or more appearances of the particular

7 symbol in the polynary string, and adding the sum to an average residual relative

8 coordinate value.

1 10. The method of claim 9, wherein each appearance value corresponding to an

2 appearance of a particular symbol is dependent on the position of the particular

3 appearance of the particular symbol in the polynary string.

1   11.   The method of claim 10, wherein each appearance value corresponding to an

2   appearance of a particular symbol is equal to a positional value associated with the

3   position of the particular appearance in the polynary string.


1   12.   The method of claim 11, wherein

2         each positional value equals to $(1 - F) \times F^{**}(k - 1)$, and

3         the average residual relative coordinate value equals $(1 - F) \times F^{**}K$,

4         where F equals $(n - 1)/n$,

5               k denotes a position in a polynary string,

6               n equals the number of relative coordinate values, and

7               K equals the length of the polynary string.


1   13.   The method of claim 2, wherein the method further comprises

2         receiving a first zooming specification comprising one or more of said

3   polynary string constituting symbols;

4         excluding a first subset of said first regions based at least in part on said

5   received first zooming specification; and

6         repeating said displaying for the remaining ones of said first regions in an

7   expanded manner.


1   14.   The method of claim 13, wherein the method further comprises

2         receiving a second zooming specification comprising one or more additional

3   ones of said polynary string constituting symbols;

4         excluding a second subset of said remaining ones of said first regions based

5   at least in part on said received second zooming specification; and

6         repeating said displaying for the remaining ones of said first regions.

1  15.  The method of claim 14, wherein the method further comprises

2      receiving an unzoom specification;

3      restoring the remaining ones of said first regions to re-include said excluded

4  second subset of said first regions; and

5      repeating said displaying for the remaining ones of said first regions.


1  16.  The method of claim 13, wherein the method further comprises

2      receiving an unzoom specification;

3      restoring the remaining ones of said first regions to re-include said excluded

4  first subset of said first regions; and

5      repeating said displaying for said first regions.


1  17.  The method of claim 1, wherein said associating comprises for each of said

2  first regions, associating a selected one of a plurality of symbols with the region

3  based at least in part on the determined graphing value of the region.


1  18.  The method of claim 1, wherein said associating comprises for each of said

2  first regions, associating a selected one of a plurality of color attributes with the

3  region based at least in part on the determined graphing value of the region.


1  19.  The method of claim 1, wherein said associating comprises for each of said

2  first regions, associating a selected one of a plurality of colored geometric primitives

3  with the region based at least in part on the determined graphing value of the region.

1    20.    The method of claim 1, wherein said associating comprises for each of said

2    first regions, associating a selected blending of a plurality of colors with the region

3    based at least in part on contributions to the determined graphing value of the

4    region.


1    21.    The method of claim 1, wherein said first regions correspond to all

2    constituting regions of the first recursively partitioned/nested geometric structure,

3    said first normalized multi-dimensional data are values of independent variables of a

4    function, and said first graphing values are corresponding values of a dependent

5    variable of the function.


1    22.    The method of claim 1, wherein the method further comprises

2         identifying a second plurality of regions within a second recursively

3    partitioned/nested geometric structure that correspond to a second plurality of

4    normalized multi-dimensional data of a second normalized multi-dimensional data

5    space, the second recursively partitioned/nested geometric structure being

6    corresponding to the second normalized multi-dimensional data space;

7         determining corresponding second graphing values for said second

8    corresponding regions within said second recursively partitioned/nested geometric

9    structure determined for said second normalized multi-dimensional data of said

10    second normalized multi-dimensional data space;

11         associating corresponding second visual attributes with said second

12    corresponding regions within said second recursively partitioned/nested geometric

13    structure, based at least in part on corresponding ones of said determined second

14    graphing values; and

15          displaying said second recursively partitioned/nested geometric structure,

16   visually differentiating said second corresponding regions based at least in part on

17   corresponding ones of said associated second visual attributes.

1   23.     The method of claim 22, wherein said first and second recursively

2   partitioned/nested geometric structures are displayed in a manner such that both

3   recursively partitioned/nested geometric structures are visible concurrently.

1   24.     The method of claim 23, wherein each of said first and second normalized

2   multi-dimensional data of said first and second normalized multi-dimensional data

3   spaces comprises a polynary string having a plurality of symbols, encoding a

4   plurality of relative coordinate values, the method further comprises

5          receiving a first zooming specification comprising one or more of said

6   polynary string constituting symbols;

7          excluding a first subset of said first regions based at least in part on said

8   received first zooming specification;

9          excluding a second subset of said second regions based at least part on the

10   removed ones of said first regions; and

11          repeating said displaying for the remaining ones of said first and second

12   regions.

1   25.     The method of claim 22, wherein said first and second normalized multi-

2   dimensional data are values of first and second input variables.

1    26.    The method of claim 22, wherein said first normalized multi-dimensional data

2    are values of input variables, and said second normalized multi-dimensional data

3    are values of corresponding output variables.

1    27.    The method of claim 1, wherein the method further comprises computing a

2    location for a centroid for each of a plurality primitive elements of the geometric

3    structure.

1    28.    The method of claim 27, wherein coordinates $(x_p, y_p)$ of the location of each

2    centroid is computed as follows:

3    $$Xp = Xc + R * \sum_{k=1}^{K} V(N,k) * C(N, m[Lk])$$

4    $$Yp = Yc + R * \sum_{k=1}^{K} V(N,k) * S(N, m[Lk])$$

5    where:

6        $(X_c, Y_c)$ are coordinate values of the geometric structure's centroid;

7        R is a radius extending from the geometric structure's centroid to an

8            outermost vertex of the geometric structure;

9        $V(N, k)$ is $w*(1 - w)**(k - 1)$ where $w = 1/(1+sine(\pi/N))$;

10       $m[L_k]$ is outer vertex number (1, 2, ..., N) assigned to the kth symbol

11           appearing in a corresponding polynary string;

12         $C(N, m[L_k]) = cosine(a* \pi)$; and

13         $S(N, m[L_k]) = sine(a* \pi)$ [where $a = (5*N - 4*m[L_k])/(2*N)$].

1    29.    The method of claim 28, wherein the K values of $V(N, k)$ are computed once

2    responsive to a specification of N.

1    30.    The method of claim 28, wherein at least the N values of $C(N, m[L_k])$ or the N

2    values of $S(N, m[L_k])$ are computed once responsive to a specification of N.

1    31.    A processor implemented data processing method for generating a polynary

2    string representation for an entity defined by n relative coordinate values, n being an

3    integer, comprising:

4            associating n symbolic representations with said n relative coordinate values;

5    and

6            selecting the symbolic representation corresponding to the highest relative

7    coordinate value as the first constituting member of the polynary string

8    representation.

1    32.    The method of claim 31, wherein the method further comprises

2            computing a constant value (F) by dividing $(n - 1)$ by n; and

3            computing a variable value (G) by subtracting F from 1;

4            subtracting G from the current highest relative coordinate value; and

5            selecting the symbolic representation corresponding to the current highest

6    relative coordinate value as the next constituting member of the polynary string

7    representation.

1    33.    The method of claim 32, wherein the method further comprises

2            multiplying the current value of G by F;

3            subtracting G from the current highest relative coordinate value; and

4            selecting the symbolic representation corresponding to the current highest

5    relative coordinate value as the next constituting member of the polynary string

6    representation.

1   34.   The method of claim 33, wherein the method further comprises repeating

2   said multiply, subtracting and selecting operations set forth in claim 29.

1   35.   The method of claim 31, wherein said symbolic representation comprises a

2   letter.

1   36.   The method of claim 31, wherein said symbolic representation comprises a

2   special character.

1   37.   A processor implemented data processing method for generating a relative

2   coordinate value for an constituting variable of an entity, the entity being

3   represented by a polynary string representation having a plurality of symbolic

4   members representing the constituting variables, the method comprising:

5       determining appearance positions of appearance instances of the symbolic

6   members in said polynary string representation;

7       summing positional values corresponding to the appearance instances of the

8   symbolic members in said polynary string representation; and

9       adding the sum to an average residual relative coordinate value.

1   38.   The method of claim 37, wherein

2       each positional value equals to $(1 - F) \times F^{**}(k - 1)$, and

3       the average residual relative coordinate value equals $(1 - F) \times F^{**}K$,

4       where F equals $(n - 1)/n$,

5           n equals the number of coordinate values,

6           k denotes a position in the polynary string representation; and

7       K equals the length of the polynary string.

1   39.    An apparatus comprising:

2      storage medium having stored therein programming instructions designed to

3  enable the apparatus to

4        identify a first plurality of regions within a first recursively

5          partitioned/nested geometric structure that correspond to a first

6          plurality of normalized multi-dimensional data of a first normalized

7          multi-dimensional data space, the first recursively partitioned/nested

8          geometric structure being corresponding to the first normalized multi-

9          dimensional data space,

10      determine corresponding first graphing values for said first corresponding

11         regions within said first recursively partitioned/nested geometric

12         structure determined for said first normalized multi-dimensional data of

13         said first normalized multi-dimensional data space;

14      associate corresponding first visual attributes with said first corresponding

15         regions within said first recursively partitioned/nested geometric

16         structure, based at least in part on corresponding ones of said

17         determined first graphing values, and

18      display said first recursively partitioned/nested geometric structure,

19         visually differentiating said first corresponding regions based at least in

20         part on corresponding ones of said associated first visual attributes;

21         and

22     at least one processor coupled to the storage medium to execute the

23  programming instructions.

1     40.     The apparatus of claim 39, wherein each of said first normalized multi-

2     dimensional data of said first normalized multi-dimensional data space comprises a

3     plurality of relative coordinate values, and the programming instructions are further

4     designed to enable the apparatus to construct a polynary string to represent each of

5     said first normalized multi-dimensional data and its corresponding one of said first

6     regions within said first recursively partitioned/nested geometric structure in

7     accordance with the relative coordinate values.


1     41.     The apparatus of claim 40, wherein said programming instructions are

2     designed to enable the apparatus to perform said constructing of a polynary string

3     by selecting a symbol as the next symbolic member of the polynary string based on

4     which of the relative coordinate values is the current highest relative coordinate

5     value.


1     42.     The apparatus of claim 41, wherein said programming instructions are further

2     designed to enable the apparatus to perform said constructing of a polynary string

3     by reducing the highest relative coordinate value in by an amount (G), upon each

4     selection, and reducing the amount (G) after each reduction.


1     43.     The apparatus of claim 42, wherein said programming instructions are

2     designed to enable the apparatus to set the amount (G) initially to $1 - F$, and

3     thereafter reduced each time by $G*(1 - F)$, where F equals $(n - 1)/n$, and n equals

4     the number of relative coordinate values.


1     44.     The apparatus of claim 40, wherein said programming instructions are

2     designed to enable the apparatus to perform said determining by determining

3    frequencies of occurrence of the various polynary strings of said first normalized

4    multi-dimensional data, and assigning the determined frequencies of occurrence to

5    the corresponding first regions within the first recursively partitioned/nested

6    geometric structure as the determined first graphing values of the corresponding first

7    regions.

1    45.    The apparatus of claim 39, wherein said programming instructions are

2    designed to enable the apparatus to perform said determining by assigning first

3    output values corresponding to the first normalized multi-dimensional data as the

4    determined first graphing values of the corresponding first regions within the first

5    recursively partitioned/nested geometric structure.

1    46.    The apparatus of claim 45, wherein said programming instructions are further

2    designed to enable the apparatus to perform said determining by computing said

3    first output values.

1    47.    The apparatus of claim 46, wherein each of said first normalized multi-

2    dimensional data of said first normalized multi-dimensional data space comprises a

3    polynary string having a plurality of symbols, encoding a plurality of relative

4    coordinate values, and said programming instructions are designed to enable the

5    apparatus to perform said computing by

6        summing one or more appearance values corresponding to one or more

7    appearances of the particular symbol in a polynary string, and adding the sum to an

8    average residual relative coordinate value, and

9        repeating said summing and adding for each constituting symbols of the

10   polynary string.

1  48.  The apparatus of claim 47, wherein each appearance value corresponding to

2  an appearance of a particular symbol is dependent on the position of the particular

3  appearance of the particular symbol in the polynary string.

1  49.  The apparatus of claim 48, wherein each appearance value corresponding to

2  an appearance of a particular symbol is equal to a positional value associated with

3  the position of the particular appearance in the polynary string.

1  50.  The apparatus of claim 49, wherein

2      each positional value equals to $(1 - F) \times F^{**}(k - 1)$, and

3      the average residual relative coordinate value equals $(1 - F) \times F^{**}K$,

4      where F equals $(n - 1)/n$,

5          k denotes a position in a polynary string,

6          n equals the number of relative coordinate values, and

7          K equals the length of the polynary string.

1  51.  The apparatus of claim 40, wherein said programming instructions are further

2  designed to enable the apparatus to

3      receive a first zooming specification comprising one or more of said polynary

4  string constituting symbols;

5      exclude a first subset of said first regions based at least in part on said

6  received first zooming specification; and

7      repeat said displaying for the remaining ones of said first regions in an

8  expanded manner.

1  52.  The apparatus of claim 51, wherein said programming instructions are further

2  designed to enable the apparatus to

3        receive a second zooming specification comprising one or more additional

4  ones of said polynary string constituting symbols;

5        exclude a second subset of said remaining ones of said first regions based at

6  least in part on said received second zooming specification; and

7        repeat said displaying for the remaining ones of said first regions.


1  53.  The apparatus of claim 52, wherein said programming instructions are

2  designed to enable the apparatus to

3        receive an unzoom specification;

4        restore the remaining ones of said first regions to re-include said excluded

5  second subset of said first regions; and

6        repeat said displaying for the remaining ones of said first regions.


1  54.  The apparatus of claim 51, wherein said programming instructions are further

2  designed to enable the apparatus to

3        receive an unzoom specification;

4        restore the remaining ones of said first regions to re-include said excluded

5  first subset of said first regions; and

6        repeat said displaying for said first regions.


1  55.  The apparatus of claim 39, wherein said programming instructions are

2  designed to enable the apparatus to perform said associating by associating, for

3  each of said first regions, a selected one of a plurality of symbols with the region

4  based at least in part on the determined graphing value of the region.


Van Koningsveld – Mulit-Variate Data
and Related Presentation and Analysis
   40   Express Mail Label # EV051081895US
ATA/mjt

1 56. The apparatus of claim 39, wherein said programming instructions are

2 designed to enable the apparatus to perform said associating by associating, for

3 each of said first regions, a selected one of a plurality of color attributes with the

4 region based at least in part on the determined graphing value of the region.

1 57. The apparatus of claim 39, wherein said programming instructions are

2 designed to enable the apparatus to perform said associating by associating, for

3 each of said first regions, a selected one of a plurality of colored geometric

4 primitives with the region based at least in part on the determined graphing value of

5 the region.

1 58. The apparatus of claim 39, wherein said programming instructions are

2 designed to enable the apparatus to perform said associating by associating, for

3 each of said first regions, a selected blending of a plurality of colors with the region

4 based at least in part on contributions to the determined graphing value of the

5 region.

1 59. The apparatus of claim 39, wherein said first regions correspond to all

2 constituting regions of the first recursively partitioned/nested geometric structure,

3 said first normalized multi-dimensional data are values of independent variables of a

4 function, and said first graphing values are corresponding values of a dependent

5 variable of the function.

1 60. The apparatus of claim 39, wherein said programming instructions are further

2 designed to enable the apparatus to

3    identify a second plurality of regions within a second recursively

4    partitioned/nested geometric structure that correspond to a second plurality of

5    normalized multi-dimensional data of a second normalized multi-dimensional data

6    space, the second recursively partitioned/nested geometric structure being

7    corresponding to the second normalized multi-dimensional data space;

8    determine corresponding second graphing values for said second

9    corresponding regions within said second recursively partitioned/nested geometric

10   structure determined for said second normalized multi-dimensional data of said

11   second normalized multi-dimensional data space;

12   associate corresponding second visual attributes with said second

13   corresponding regions within said second recursively partitioned/nested geometric

14   structure, based at least in part on corresponding ones of said determined second

15   graphing values; and

16   display said second recursively partitioned/nested geometric structure,

17   visually differentiating said second corresponding regions based at least in part on

18   corresponding ones of said associated second visual attributes.


1    61.   The apparatus of claim 60, wherein said first and second recursively

2    partitioned/nested geometric structures are displayed in a manner such that both

3    recursively partitioned/nested geometric structures are visible concurrently.


1    62.   The apparatus of claim 61, wherein each of said first and second normalized

2    multi-dimensional data of said first and second normalized multi-dimensional data

3    spaces comprises a polynary string having a plurality of symbols, encoding a

4    plurality of relative coordinate values, said programming instructions are further

5    designed to enable the apparatus to

6        receive a first zooming specification comprising one or more of said polynary

7    string constituting symbols;

8        exclude a first subset of said first regions based at least in part on said

9    received first zooming specification;

10       exclude a second subset of said second regions based at least part on the

11    removed ones of said first regions; and

12       repeat said displaying for the remaining ones of said first and second regions.

1    63.    The apparatus of claim 60, wherein said first and second normalized multi-

2    dimensional data are values of first and second input variables.

1    64.    The apparatus of claim 60, wherein said first normalized multi-dimensional

2    data are values of input variables, and said second normalized multi-dimensional

3    data are values of corresponding output variables.

1    65.    The apparatus of claim 39, wherein said apparatus is a selected one of a

2    palm sized processor based device, a notebook computer, a desktop computer, a

3    set-top box, a single processor server, a multi-processor server, and a collection of

4    coupled servers.

1    66.    The apparatus of claim 37, wherein said programming instructions are further

2    designed to compute a location for a centroid for each of a plurality of primitive

3    elements of the geometric structure.

1    67.    The apparatus of claim 66, wherein said programming instructions are

2    designed to compute coordinates $(x_p, y_p)$ of the location of each centroid as follows:

3 $$Xp = Xc + R * \sum_{k=1}^{K} V(N,k) * C(N, m[Lk])$$

4 $$Yp = Yc + R * \sum_{k=1}^{K} V(N,k) * S(N, m[Lk])$$

5     where:

6         $(X_c, Y_c)$ are coordinate values of the geometric structure's centroid;

7         R is a radius extending from the geometric structure's centroid to an

8             outermost vertex of the geometric structure;

9         $V(N, k)$ is $w*(1 - w)**(k - 1)$ where $w = 1/(1+sine(\pi/N))$;

10         $m[L_k]$ is outer vertex number $(1, 2, ..., N)$ assigned to the kth symbol

11             appearing in a corresponding polynary string;

12         $C(N, m[L_k]) = cosine(a* \pi)$; and

13         $S(N, m[L_k]) = sine(a* \pi)$ [where $a = (5*N - 4*m[L_k])/(2*N)$].

1   68.    The apparatus of claim 67, wherein said programming instructions are

2 designed to compute the K values of $V(N, k)$ once responsive to a specification of N.

1   69.    The method of claim 67, wherein said programming instructions are designed

2 to compute at least the N values of $C(N, m[L_k])$ or the N values of $S(N, m[L_k])$ once

3 responsive to a specification of N.

1   70.    An apparatus comprising

2         storage medium having stored therein programming instructions designed to

3 enable the apparatus to

4             associate n symbolic representations with said n relative coordinate

5                values, and

6        select the symbolic representation corresponding to the highest

7        relative coordinate value as the first constituting member of the

8        polynary string representation; and

9    at least one processor coupled to the storage medium to execute the

10  programming instructions.

 

1    71.    The apparatus of claim 70, wherein the programming instructions further

2    enable the apparatus to

3        compute a constant value (F) by dividing $(n - 1)$ by n; and

4        compute a variable value (G) by subtracting F from 1;

5        subtract G from the current highest relative coordinate value; and

6        select the symbolic representation corresponding to the current highest

7  relative coordinate value as the next constituting member of the polynary string

8  representation.

 

1    72.    The apparatus of claim 71, wherein the programming instructions further

2    enable the apparatus to

3        multiply the current value of G by F;

4        subtract G from the current highest relative coordinate value; and

5        select the symbolic representation corresponding to the current highest

6  relative coordinate value as the next constituting member of the polynary string

7  representation.

 

1    73.    The apparatus of claim 72, wherein the programming instructions further

2    enable the apparatus to repeat said multiply, subtracting and selecting operations

3    set forth in claim 64.

1    74.    The apparatus of claim 70, wherein said symbolic representation comprises a

2    letter.

1    75.    The apparatus of claim 70, wherein said symbolic representation comprises a

2    special character.

1    76.    The apparatus of claim 70, wherein said apparatus is a selected one of a

2    palm sized processor based device, a notebook computer, a desktop computer, a

3    set-top box, a single processor server, a multi-processor server, and a collection of

4    coupled servers.

1    77.    An apparatus comprising:

2       storage medium having stored therein a plurality of programming instructions

3    designed to enable the apparatus to

4          determine appearance positions of appearance instances of symbolic

5            members of a polynary string representation of an entity having a

6            number of constituting variables, the symbolic members being

7            corresponding to the constituting variables,

8         sum positional values corresponding to the appearance instances of the

9            symbolic members in said polynary string representation, and

10        add the sum to an average residual relative coordinate value; and

11       at least one processor coupled to the storage medium to execute the

12    programming instructions.

1    78.    The apparatus of claim 77, wherein

2        each positional value equals to $(1 - F) \times F^{**}(k - 1)$; and

3        the average residual relative coordinate value equals $(1 - F) \times F^{**}K$,

4        where F equals $(n - 1)/n$,

5                n equals the number of coordinate values,

6                k denotes a position in the polynary string representation; and

7                K denotes the length of the polynary string.

1    79.    The apparatus of claim 77, wherein said apparatus is a selected one of a

2    palm sized processor based device, a notebook computer, a desktop computer, a

3    set-top box, a single processor server, a multi-processor server, and a collection of

4    coupled servers.

1